buting in any way to the advance of philology.—Hypothetical suggestions as to the origin of right-handedness or left-handedness, by M. Dareste. The author believes that we must seek in embryonic relations for the preponderance of the right hand over the left, in which he sees a possible result of the position generally maintained by the fœtus in regard to the vitellus, in which one side of the body enjoys greater freedom for development than the opposite one. Dr. Dareste wishes to verify, by the observation of others, his hypothesis that left-handedness is present in those who suffer from inversion of the viscera (heterotaxy), which would seem to be unquestionably due to malposition in the fœtal state.—M. Sebillot has presented to the Society a comprehensive formula of questions relating to the appearance, character, and various other phenomena of the sea, together with the popular legends and superstitions connected with it by different races. These he wishes to see incorporated with the Society's authorised directions for travellers.—Note on May celebrations in the Gironde, by M. Daleau.—Discussion on the assumed Quaternary jaw found at Châlons-sur-Marne, and forming part of M. Nicaise's collection. M. Topinard, who gave the result of his own measurements, considers that the differences between this jaw and the one found at Naulette prove the co-existence, in primæval ages, of different human types. The Naulette jaw he regards as unique of its kind, differing as it does from the thousand and upwards of inferior maxillæ which he had examined with special reference to this question. — On the difficulties of distinguishing between genuine prehistoric trepanning and recently effected injuries of the crania, either through accident in the process of exhumation, or for purposes of deception, by M. Manouvrier.—On the best means of measuring the cranial capacity, by M. de Jouvenrel.—On Broca's method of determining cranial cubage, as exemplified by means of a bronze test-cranium, by M. Topinard.—On an archæological exploration on the Island of Téviec, near Quiberon, by M. Gaillard. The similarity of the dolmens, shells, and bones with those on the neighbouring mainland, and the numbers and character of the silex and bone fragments found on the island, lead the writer to believe that a separation from the continent has been effected since prehistoric ages.—On the Dutch dwarf known as Princess Pauline, by M. Mortillet.—On curious methods of conducting barter in parts of Asia and Africa, by M. Hovelacque. In tracing the history of the development of the process of bartering silently and from a distance, which still prevails between tribes or castes who refuse to meet or be seen by each other, the author draws attention to notices by Herodotus which prove the existence of the same customs among the people of Libya.—On the existence of wars in primæval times, by Dr. Hoffman, of Washington.—On the finds of a cave near Ojcow, by M. Zaborowski. Numerous fragments of the bones of the mammoth, rhinoceros, hyæna, and cave-bear were found intermixed with those of the ox, horse, hare, &c., together with flint knives, bone implements, &c.—On the brain of an insane woman, by M. Rey.—On a case of microcephalism, by M. Letourneau.—On a gibbon-fœtus and its placenta, by M. Deniker.—On ideas and memory, by M. Fauville. In this elaborate treatise the author considers memory as the result of special manifestations of the impressionability of the sensient cellules of the brain, while ideas are defined as the consequences of sensations.—On the common origin of Malays and Dravidians, by M. O. Beauregard. In this sequel to his former paper on the subject of the Malayan races the author begins with their language, which may be traced from the Moluccas as far west as Easter Island, many words in use among the inhabitants of the various island-groups that lie between these remote limits being absolutely the same. This paper is an exhaustive compendium of what has been written by other authors, chiefly Englishmen, on the language and legendary literature, the political and social constitution, and the religion and laws of the Malayan and Dravidian races, with special reference to those settled in Ceylon.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, February 11.—"The Electrical Phenomena accompanying the Process of Secretion in the Salivary Glands of the Dog and Cat." By W. Maddock Bayliss, B.Sc., and J. Rose Bradford, B.Sc., Senior Demonstrator of Anatomy in University College, London (from the Physiological Laboratory of University College). Communicated by E. A. Schäfer, F.R.S.

March 11.—"The Influence of Stress and Strain on the Physical Properties of Matter. Part I. Elasticity (continued). The Internal Friction of Metals." By Herbert Tomlinson, B.A. Communicated by Prof. W. Grylls Adams, M.A., F.R.S.

An abstract of a paper on this subject has been already published (*Proc. Roy. Soc.*, vol. xxxviii. p. 42), but the paper itself was withdrawn for the purpose of revision. The fresh experiments which have been for this purpose instituted during the last year, besides confirming the results of the older ones, as far as the latter have been published, have furnished, more or less in addition, the following facts relating to the internal molecular friction of metals:—

The proportionate diminution of amplitude is independent of the amplitude, provided the deformations produced do not exceed a certain limit. This limit varies with the nature of the metal, and is for nickel very low.

The logarithmic decrement of amplitude increases with the length of the vibration-period, but in a less proportion than the latter, and in a diminishing ratio. The amount of increase of the logarithmic decrement, attending on a given increase through a given range of the vibration-period, varies with the nature of the metal, and with those metals which possess comparatively small internal friction becomes almost insensible. It follows as a consequence that the internal friction of metals differs from the viscosity of fluids, for in cases of damping by the latter the logarithmic decrement is *inversely* as the length of the vibration-period.

Permanent molecular strain resulting from loading not carried to a sufficient extent to produce sensible permanent extension, diminishes the internal friction, and increases the torsional elasticity.

Considerable permanent longitudinal extension and permanent torsion produce increase of internal friction and diminution of torsional elasticity. The effect of torsion is much greater than that of extension, and the increase of internal friction is much greater than the decrease of torsional elasticity. As a consequence, wire-drawing, where we have permanent extension and torsion combined, sometimes increases enormously the internal friction; in fact, in the case of six different metals it was found that, by careful annealing, the internal friction was decreased from *one-half to one-thirtieth* of the original amount of friction of the metals in the hard-drawn condition.

The internal friction of a metal wire, whether in the hard-drawn or annealed condition, is temporarily decreased, and the torsional elasticity is temporarily increased by loading not carried beyond a certain limit; beyond this limit both the friction and the elasticity become independent of the load.

The "fatigue of elasticity," discovered by Sir William Thomson in metal wires when vibrating torsionally, is not felt, provided the deformations produced do not exceed a certain limit, depending upon the nature of the metal. The above-mentioned limit is extraordinarily low for nickel, so low, indeed, that it is difficult to avoid "elastic fatigue" with this metal. This last consideration, and others founded on the results of experiments on the effects of stress on the physical properties of nickel, tend to show that the molecules of this metal are comparatively easily rotated about their axes.

The author agrees with Prof. G. Wiedemann, that the loss of energy due to internal friction in a torsionally vibrating wire is mainly due to the to-and-fro rotation of the molecules about their axes; any cause, therefore, which increases the molecular rotatory elasticity diminishes the internal friction, and conversely.

The molecules of a metal tend to creep into such positions as will ensure a maximum molecular rotatory elasticity, and they can be assisted in doing so by agitations effected either by thermal or mechanical agency; hence—

Rest after suspension, aided by oscillations at intervals, diminishes the internal friction of a wire which has been recently suspended, or which after a long suspension has been subjected to considerable molecular agitation by either mechanical or thermal agency.

On the contrary, when a maximum molecular rotatory elasticity has been reached, molecular agitation, if carried beyond a certain limit, diminishes the elasticity; hence the results of "fatigue of elasticity;" and hence—

Mechanical shocks and rapid fluctuations of temperature beyond certain limits may considerably increase the internal friction, and, though to a much less extent, diminish the torsional elasticity.

The logarithmic decrement is independent of both the length and diameter of the wire.

"Effects of Stress and Magnetisation on the Thermo-electric Quality of Iron." By Prof. J. A. Ewing, B.Sc., F.R.S.E., University College, Dundee. Communicated by Sir William Thomson, F.R.S.

This paper comprises a revised version of one submitted to the Royal Society in 1881, under the title "Effects of Stress on the Thermo-electric Quality of Metals, Part I." (published in abstract in *Proc. Roy. Scc.*, No. 214, 1881), along with much new matter. It deals principally with the cyclic changes of thermo-electric quality which an iron wire undergoes when exposed to cyclic variations of stress (described in the abstract of the former paper), and with the relations of these changes of thermo-electric quality to the changes of magnetism which also occur as an effect of stress. Stress was applied by exposing the wire to longitudinal pull by means of loads. The changes both of thermo-electric quality and of magnetism exhibit that tendency to lag behind the changes of stress to which in a previous paper (*Proc. Roy. Soc.*, No. 216, 1881, p. 22) the author gave the name *hysteresis*, and the effects are sufficiently similar in regard to the two qualities to suggest that the changes of thermo-electric quality occur as secondary effects of changes of magnetism. To examine whether this is the case, simultaneous measurements of the magnetic and thermo-electric effects of stress on an iron wire were made, and also independent observations of the thermo-electric effects of magnetisation, without change of stress. A comparison of these made it clear that stress causes change in the thermo-electric quality of iron directly, and not as a secondary effect of magnetisation. If the wire be completely demagnetised to begin with, and kept clear of all magnetisation during the application and removal of stress, the presence of hysteresis is not less marked than before. Experiments are given to show how the thermo-electric effects of stress are modified by the existence of more or less magnetisation in the wire; and, conversely, how the thermo-electric effects of magnetism are modified by the existence of more or less constant stress. The influence of vibration in destroying the effects of hysteresis is investigated, and also the result of exposing the wire to the process of demagnetising by repeated rapid reversals of a continuously diminishing magnetising force, and it is shown that this process acts in the same way as vibration in destroying the effects of hysteresis. Residual effects of hysteresis are studied, as, for example, the difference which presents itself when a wire is magnetised after having been loaded strongly and then unloaded down to a certain constant state of stress, and, on the other hand, when the same state of stress has been produced by simply increasing the load; and it is shown that these residual effects are wiped out by vibration or by demagnetising by reversals. With regard to the effects of stress on thermo-electric quality it is shown that if a somewhat soft wire be more and more strongly magnetised these effects become more and more similar to those which are found when the wire is hard-drawn but not magnetised. A few experiments were made with wires of silver, copper, lead, magnesium, and German silver, but in none of these was hysteresis of thermo-electric quality with regard to load discovered.

Special attention is directed to a peculiar feature in the curves by means of which the experimental results are exhibited. In curves showing the relation of thermo-electric electromotive force to load, it is shown that any reversal from loading to unloading, and *vice versâ*, causes an inflection in the curve, the first effect of the new process being to continue the kind of change of thermo-electric quality that was going on before. That this is not due to any mechanical disturbance which the loading or unloading produces is shown by the fact that it occurs in an equally marked way after the molecules have been brought to a condition of stable equilibrium by vibrating the wire before beginning to load or unload. It is suggested that the effects of hysteresis, described in the paper, have a possible relation to the properties which Prof. Osborne Reynolds has recently shown to be possessed by granular media.

The experiments described in the paper are closely connected with those which were communicated to the Society in January 1885, under the title "Experimental Researches in Magnetism," and are now being published in the *Philosophical Transactions*. They were conducted in the Physical Laboratory of the University of Tokio, in 1881–83, partly with the help of one of the author's Japanese students, Mr. S. Sakai. The results are given graphically, and are for the most part reduced to absolute measure.

March 18.—"On the Properties of Matter in the Gaseous and Liquid States under Various Conditions of Temperature and Pressure." By the late Thomas Andrews, M.D., LL.D., F.R.S. Communicated by the President.

The following are the general conclusions to which this inquiry has led:—

(1) The law of gaseous mixtures, as enunciated by Dalton, is largely deviated from in the case of mixtures of nitrogen and carbonic acid at high pressures, and is probably only strictly true when applied to mixtures of gases in the so-called perfect state.

(2) The critical point of temperature is lowered by admixture with a permanent gas.

(3) When carbonic acid gas and nitrogen diffuse into each other at high pressures, the volume of the mixture is increased.

(4) In a mixture of liquid carbonic acid and nitrogen at temperatures not greatly below the critical point, the liquid surface loses its curvature, and is effaced by the application of pressure alone, while at lower temperatures the nitrogen is absorbed in the ordinary way, and the curvature of the liquid surface is preserved so long as any portion of the gas is visible.

Linnean Society, April 1.—Sir John Lubbock, Bart., President, in the chair.—Mr. J. G. Baker exhibited *Scolopendrium Devalyi*, a new species of fern discovered by the Abbé Devalyi in the province of Yunnan.—Dr. F. Day showed photographs of the fully-grown skulls of *Salmo salar* and *S. fario*, in proof of the marked cranial differences existent in the very adult stages of the salmon and the trout.—A paper was read, botanical observations made in a journey to the Naga Hills (between Assam and Munipore), by Mr. C. B. Clarke. Writing from Kohima, a station 4750 feet altitude, he says the country above 5000 feet is nearly all jungle, and that the predominant plant-groups, such as the Commelinaceæ, Rubi, Senecio, and ferns, besides others, are nearly all identical with those growing in Sikkim, while, on the contrary, many Khasi plants are conspicuously absent. Various kinds of oaks form forests around Kohima, and the alder is abundant, the latter occasionally having an enormous trunk. The Nagas pollard the alder at 6 feet from the ground, and cut the innumerable sprouts for firewood. Two rare species of Dyospyros were observed. The flora is altogether rich and interesting, though there are few new species. Mr. Clarke gives an account of his ascent of Jakpho, a mountain-peak 9980 feet high, and about 10 miles distant from Kohima. *Lomaria glauca*, a rare fern in Khasia, is here plentiful, rhododendrons are plentiful at 8500, and the ridge at the top is clothed with dwarf bamboo. The levels 5000 to 7000 feet on Jakpho are mostly forests of shrubby Strobilanthes 6 to 12 feet high, just as in Sikkim. There are several laurels, and *Ilex Aquifolium* exists as a tree 30 to 40 feet high. The Convolvulaceæ are prominent up to 5000 feet.—The first part of a lengthened technical communication, "Index Floræ Sinensis," or an enumeration of all the plants known from China proper, Formosa, the Corea, and the Luchu Islands, together with their synonymy and distribution, was spoken to by the authors, Messrs. F. B. Forbes and W. B. Hemsley.—Afterwards a paper was read by Mr. H. N. Ridley, on the fresh-water Hydrocharideæ of Africa. Among many new species described is *Bootia exserta*, obtained by Sir John Kirk on the borders of the Zambesi in 1860.—The Secretary read a communication, on the vegetation of the Arctic regions, by M. Buysman. The author remarks that the flora of Greenland is decidedly Scandinavian in character. Almost all the plants are also found in Lapland, but, notwithstanding the proximity of America, few belong to that continent, while Asiatic Arctic types are rare. Some 378 species of phanerogams and cryptogams compose the Greenland flora. Of these, over 200 are found on the eastern coast, only 7 of them being absent on the western shore, while 170 species are recorded from the west, these being absent on the east. Nova Zemlya and the Island of Waigatz together possess 290 species, and Spitzbergen 117 species. The author enters into particulars regarding the special plants peculiar to the seaboard, and such as are cultivated by the inhabitants both in the open air and under cover. He remarks that the long and continuous summer sunlight, and at times intense heat, have much influence on the vegetation, and counterbalance the dark severe winter season.

Geological Society, February 24.—Prof. J. W. Judd, F.R.S., President, in the chair.—William Barns Kinsey and Henry Maurice Platnauer were elected Fellows, and Prof. Juan Vilanova y Piera, the University, Madrid, a Foreign Correspondent of the Society.—The following communications were read:—On two Rhætic sections in Warwickshire, by Rev. P. B. Brodie, M.A., F.G.S. The sections noticed in this paper were (1) one exposed on a railway at Summer Hill, near Binton, between Stratford and Alcester, and (2) one, thirteen miles further to the south-east, at Snitterfield, three miles north of Stratford-on-Avon, in excavations for a tunnel connected with a supply of water to that town. At the first-named locality, a bed with insect remains overlies the firestone and *Estheria*-bed, and this is succeeded in descending order by a considerable thickness of black and grey shales with the usual Rhætic fossils. The bone-bed is not exposed. At the second locality, in borings and shafts, black Rhætic shales were found in three places resting upon a denuded surface of new Red Marl, and covered by between 40 and 50 feet of drift. *Avicula contorta* and other typical fossils were obtained from the shales. In other shafts the Rhætic beds were wanting, so that apparently those met with were merely small portions remaining of a larger mass which had been denuded away.—On the basement-beds of the Inferior Oolite of Gloucestershire, by E Witchell, F.G.S.—On the Pliocene Beds of St. Erth, by Percy F. Kendall and Robert G. Bell, F.G.S. This paper consisted of a description of the beds exposed at St. Erth, a list of the Molluscan fossils identified, and some preliminary considerations of the evidence afforded by the Mollusca, and may be considered a continuation of that by the late Mr. S. V. Wood, read to the Society in November 1884.

Royal Meteorological Society, March 17.—Mr. W. Ellis, F.R.A.S., President, in the chair.—Mr. W. E. Addison, Mr. A. W. Clayden, M.A., F.G.S., Mr. T. B. Moody, R.N., and Dr. W. Schlich were elected Fellows of the Society.—The President gave an historical sketch of the barometer. After remarking on the accidental nature of the discovery of the instrument in the year 1643 in its best form, in ignorance for some time of its value for purposes of meteorological inquiry, he gave a brief account of many early kinds of barometers, the first endeavour being, in consequence of difficulties experienced with the ordinary mercurial form, to enlarge the scale of variation, attempts which in general introduced other errors and inconveniences. The desire to experiment on elevated positions induced the construction of an early form of portable barometer—one such with cistern completely closed, leaving the air to communicate through the pores of the wood, having been made above 200 years ago. The President further described various points in the arrangement of the Ramsden, Gay Lussac, and other barometers, including also mention of some modern patterns of long-range barometers, standard barometers, and such barometers as are more commonly used. The practice of driving out air from the mercury by heating or boiling appears to have been in use early in the last century. Engraved plates indicating the weather to be expected with different heights of the mercury have been longer used, at least as early as 1688. As regards correction for temperature, De Luc in the last century adopted a temperature corresponding to 54°·5 F. as that to which to make reduction, because corresponding nearly to the average of observations, such reduction being now made to the natural zero, 32° F. Reference was made to the employment of water (as in the well-known Royal Society barometer) and other liquids instead of mercury; also to various kinds of floating and other barometers not at all, or not entirely, mercurial, and to metallic barometers. The President concluded his account with a sketch of the history of recording barometers or barographs, including a notice of the application of photography and electricity to recording purposes.—At the conclusion of the President's address the meeting was adjourned to afford the Fellows and their friends an opportunity of inspecting the valuable and interesting exhibition of barometers which was opened on Tuesday evening.

Anthropological Society, March 23.—Mr. Hyde Clarke, Vice-President, in the chair.—Capt. C. R. Conder, R.E., read a paper on the present condition of the native tribes in Bechuanaland. The new Crown colony of Bechuanaland is a pastoral country, consisting of a great plateau 4000 feet above the sea, with a fine climate, and grazing-lands said to be among the finest in South Africa. The native population consists of about 183,000 souls, belonging to various tribes. The Korannas are a small slightly-built people with a strongly Turanian type of face, but with hair growing in isolated tufts as among the Bantu races; they colour the face and hands with red lead, and black lead is often used for colouring the hair. The Matabele are originally Zulu, who, being unsuccessful in war, were afraid to reappear before Chaka: they settled in the Transvaal, and were driven thence to their present country by the Boers. Their name in Sechuana means "naked," and is due, not to the fact that they are lightly clad, but because they offend Bechuana ideas of decency by not wearing the small fur apron which men and boys always wear among the Bechuana, even when they have no clothes. The author described the Batlaping and Baralay tribes, and discussed some of the peculiarities of the Sechuana language. The customs, superstitions, and native government of the people were dwelt upon, and Capt. Conder concluded by referring to some of the causes of the decay of the native tribes, and urged that the chiefs should be supported in their attempts to keep brandy out of their towns.

Edinburgh

Royal Society, March 15.—Sheriff Forbes Irvine, Vice President, in the chair.—Prof. Blyth described an apparatus for determining the absolute strength of an electric current by weighing.—Dr. D. Noel Paton gave an account of an experiment concerning the connection between urea formation and bile secretion.—Dr. G. A. Atkinson read a paper on the volumetric estimation of inorganic nitrates.—Dr. Orme Masson read a paper on sulphines—Prof. D'Arcy Thompson submitted a paper on the pelvic girdle of birds and reptiles.

Paris

Academy of Sciences, March 29.—M. Jurien de la Gravière, President, in the chair.—On the flexion of prisms (continued), by M. H. Resal. In this concluding part of his memoir the author deals with the rectangular prism and the elliptical cylinder. In the special case of flexion here considered, the hypothesis advanced by him from the first on the nullity of three pressures is rejected for the elliptical prism but admitted for the rectangular prism, the problem regarding which in connection with flexion may be considered as solved.—Notes on the progress of the Panama Canal, by M. Ferdinand de Lesseps. The eminent engineer reports favourably of the progress made since his first visit six years ago. There has been great improvement in the sanitary conditions, with corresponding diminution of mortality amongst the workmen. During his inspection a rocky eminence 30 metres high, at Gamboa, about the centre of the isthmus, was successfully disintegrated by the explosion of a mine, two parts dynamite and one part powder, which removed 20,000 cubic metres without accident. With the means at present available, he considers that the canal will be completed, as promised, in 1889.—On the variations in the toxic properties of the urine in the healthy subject while awake and asleep, by M. Ch. Bouchard.—Equatorial observations of Fabry's and Barnard's comets, made at the Observatory of Algiers with the 0·50 m. telescope, by M. Ch. Trépied.—On the best instrumental dispositions for determining the elements of refraction by means of M. Lœwy's method, by Mr. David Gill. Some modifications of M. Lœwy's apparatus are proposed, with a view to simplifying its application, and increasing the general accuracy and usefulness of the method.—On the Fuchsian functions and the indefinite ternary quadratic forms, by M. H. Poincaré.—On an extension of Paschal's theorem to surfaces of the third order, by M. A. Petot.—On the determination of the genus of a holomorphous function in certain special cases, by M. de Sparre.—Note on the surface of the sixth order with six straight lines, by M. Giovanni Bordiga.—Note on the screw-pile, by M. Léauté. M. Resal having worked out the theoretical principle of this useful mechanical appliance, the author proposes a case, not considered by him, which presents the twofold practical advantage of diminishing the friction offered to the action of the screw-pile in borings, and preserving greater cohesion to the surrounding soil. In reply to this communication M. Resal expressed himself unable to adopt M. Léauté's standpoint at least until it has been put to some practical test.—On the theory of dynamo-electric machines acting as receivers (two illustrations), by M. Giza Szarvady.—Description of an absolute electrometer with continuous indications, constructed by MM. E. Bichat and R. Blondlot.—Combinations of vanadic acid with the oxygenated acids, by M. A. Ditte. Here the author deals with those oxygenated acids, such as sulphuric, arsenic, iodic, &c., which may be freely isolated under the form of crystals. Those hitherto obtained only as salts are reserved for future consideration.—On the products of decomposition of hypophosphoric acid, by M. A. Joly.—Action of platina at a red heat on the fluorides of phosphorus, by M. H. Moissan.—On the decomposition by compensation of compound bodies optically inactive, by M. E. Bichat.—On a photo-chemical reaction of the oxymetric fluid of M. Schützenberger, by M. Victor Jodin. It is shown by repeated experiments that the oxymetric reagent is of itself sensitive to light and that account should be taken of this property in researches dealing with photo-chemical reactions accompanied by a liberation of oxygen.—On the volatile character of the oxygenated nitriles, by M. Louis Henrÿ.—Note on the salivary glands in the order of Coleopteræ, by M. J. Gazagnaire. A chief result of the author's researches is the verification of the hypothesis that salivary glands are developed throughout the whole order of Coleopteræ.—On the mode of formation of the chromatophores in the Cephalopods, by M. C. Phisalix.—On the toxic properties of the Cytisus, by M. Ch. Cornevin. Of ten species of Cytisus two were found to be harmless (*C. sessiliflorus* and *C. capitatus*), two slightly venomous (*C. nigricans* and *C. supinus*), six extremely venomous (*C. Laburnum*, *C. alpinus*, *C. purpureus*, *C. Weldenii*, *C. biflorus*, and *C. elongatus*).—Note on the Palæozoic formations of the Neffiez-Cabrières district, Hérault, by M. de Rouville.

BERLIN

Physical Society, February 5.—Dr. R. von Helmholtz, in an investigation into the tensions of vapour of solutions of salt, made use of a method whereby the least depressions under which a condensation of vapour occurred, when no heat was admitted from the outside, were determined. With this end in view a glass cylinder was filled to a third of its capacity with the fluid. The space filled with a mixture of air and vapour was on one side connected with a manometer, while a second cock allowed the depression to be effected, a small over-pressure having been generated beforehand. The first formation of cloud was rendered visible in this wise, that a bundle of light was directed through the axis of the glass cylinder, and the observer in a dark section of space under small angle looked towards the axis. Experiments with pure water showed that in saturated air the depression needed first to attain a certain value before the formation of cloud set in. Under the temperature of a sitting-room this depression amounted to about 10 mm. water; at 0° a depression of 12 mm. water was required. In this investigation Herr von Helmholtz confirmed the statements of MM. Coulier and Aitken; that the formation of cloud in saturated air was induced solely by particles of dust. Saturated air completely free of dust might suffer a depression of half an atmosphere without any cloud getting formed in it. The finer and sparser were the dust-particles the slower was cloud in forming itself in the vapour-saturated air. Salt-particles and acids furthered the formation of cloud, and, most powerfully of all, particles of sal-ammoniac. An explanation of this phenomenon the speaker found in the proposition demonstrated by Sir William Thomson, that the tension of vapour was greater over convex than over even surfaces of fluidity. When the air was without dust-particles there were wanting the convex surfaces at which the tension was higher and it was possible for the precipitate to ensue. Dust-particles, on the other hand, presented such surfaces, and all the more the rougher they were. In the atmosphere dust-particles must be present as far up as to the highest layers in which clouds were formed, seeing that without them no cloud-formation was possible. This circumstance yielded support to the explanation given by Prof. Tyndall of the blue colour of the sky, in accordance with which the sky was indebted for its blue colour to the particles floating in the air. The dense and persistent fog-formations in large cities, such as London, were caused by the sulphuric acid with which the air was charged in consequence of the vast consumption of coal, and which thus favoured the formation of clouds. The fact, demonstrated by experiments, that saturated water vapour did not, even under the lowest depression, give rise to the formation of cloud, but required first to attain a perceptible magnitude, rendered necessary a change in the theoretical formulæ for the conditions of cloud-formation. Determinations executed according to this method of the tensions of vapour of various sulphuric acid solutions showed a very good agreement with those executed by Regnault.—Dr. Fröhlich gave a short report on the results of his investigations, lasting for years, into the theory of the dynamo-electrical machines, which he had developed with special reference to the practical requirements of technics, and had quite recently published in a separate work. He communicated and explained the concluding formulæ he had found for the performance of the various systems of machines, in respect of their magnetism, as also of their intensity and polar tensions. He likewise gave the formulæ for the performances of the dynamo machines as transmitters of energy. Be it here specially brought out that, in contrast with MM. Deprez and Silvanus Thompson, he had found that, for the mechanical performance of two machines of similar construction and unequal dimensions, the larger did not gain in mechanical labour to the extent of n^5, n being used to denote the linear enlargement, but only in the proportion of about n^3, in which the mass also increased. The utility-effect, on the other hand, of a machine of similar construction, increased with enlargement in the proportion of n^5.

BOOKS RECEIVED

"British Museum (Natural History) Mineral Department—An Introduction to the Study of Meteorites."—"Astronomical Observations 1882–85 made at Rousdon Observatory," by C. E. Peek.—"Arithmetic for Schools," by the Rev. J. B. Lock (Macmillan).—"Sixteenth Annual Report of the Wellington College Natural Science Society, 1885" (Bishop, Wellington).—"Key to the Text-Book on the Mechanics of Materials, &c.," by M. Merriman (Wiley, New York).—"The Elements of Economics," vol. i., by H. D. MacLeod (Longmans).—"Watt's Organic Chemistry," edited by Prof. W. A. Tilden (Churchill).—"Bulletin of the Philosophical Society of Washington," vol. viii. (Washington).—"The Doctrine of Evolution in its Application to Pathology," by Dr. W. Aitken (MacDougall, Glasgow).—"A Manual of Mechanics," by T. M. Goodeve (Longmans).—"The Code of Nomenclature and Check List of North American Birds" (American Ornithologists' Union, New York).

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